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**Patent claims**

1. Laser system having a repetition rate greater than  
5 50 kHz according to the principle of the  
regenerative amplifier, comprising at least
  - an amplifying laser medium (6),
  - a laser resonator having at least one resonator  
mirror (5) and at least one modulator (3) and
  - 10 • a pump source, in particular a laser diode  
source, for pumping the laser medium (6),characterized in that the laser resonator has a  
pulse stretcher (7, 8a, 8b) as a specially  
designed component having a structure- and/or  
15 material-related dispersive effect, the pulse  
stretcher (7, 8a, 8b) having a minimum 3<sup>rd</sup> order  
dispersion with a maximum 2<sup>nd</sup> order dispersion.
2. Laser system according to Claim 1, characterized  
20 in that the pulse stretcher (7) has a block of  
highly dispersive material, in particular  
comprising SF57 glass, SF10 glass or BK7 glass.
3. Laser system according to Claim 2, characterized  
25 in that multiple reflection takes place within the  
block, in particular by reflection at interfaces.
4. Laser system according to any of the preceding  
Claims, characterized in that the pulse stretcher  
30 (8a, 8b) has a Gires-Tournois interferometer or a  
dispersive layer structure, preferably as a  
folding mirror.

5. Laser system according to Claim 4, characterized in that the pulse stretcher (8a, 8b) has at least two reflecting surfaces, the surfaces being arranged in such a way that the surfaces are oriented
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- relative to one another and
  - at an opening angle, in particular adjustable opening angle,
- and the laser beam is reflected at least twice at
- 10 at least one of the surfaces.
6. Laser system according to any of the preceding Claims, characterized in that the laser medium (6) has an inversion life time greater than 1 ms and
- 15 is in particular Yb:glass or Yb:crystal.
7. Laser system according to any of the preceding Claims, characterized by a femtosecond oscillator (13) for inputting seed pulses, the femtosecond oscillator (13) being formed and arranged in such
- 20 a way that the seed pulses are femtosecond pulses or picosecond pulses on input into the laser resonator.
8. Laser system according to any of the preceding Claims, characterized by an electro-optical switching element as modulator (3).
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9. Laser system according to any of the preceding Claims, characterized by a pulse compressor outside the laser resonator, in particular
- 30 according to the Treacy design.

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10. Laser system according to Claim 9, characterized in that the pulse compressor has a dispersive grating having less than 1700 lines/mm, preferably less than 1200 lines/mm.